19. (a) Discuss the Mulliken symbol for irreducible representations. (6)

(b) List the symmetry elements and assign the point group of HCN and CO_2. (4)

20. Give the flow chart for the identification of point groups of molecules.

APRIL/MAY 2023

DCH23/GCH23 — PHYSICAL CHEMISTRY – II

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. Define relaxation time.
2. What is meant by first explosion limit?
3. Write the principle of voltammetry.
4. State Debye Huckle limiting law.
5. What is meant by electrolyte interface?
6. Define membrane potential.
7. Assign the point group to the following molecules.
   (a) Ammonia.
   (b) Hydrogen
8. Define symmetry.

9. Determine the number of vibrational modes of CO_2 molecule.

10. What is identity element?

SECTION B — (5 × 5 = 25 marks)

Answer ALL the questions.

11. (a) Discuss the kinetics of consecutive reactions.

Or

(b) Write a note on stopped flow technique.

12. (a) Discuss the Debye-Huckel-Bronsted equation. Write its qualitative and quantitative verification.

Or

(b) How will you determine the activity coefficient by electrochemical method?

13. (a) Write a note on electro-capillary phenomena.

Or

(b) What is electrical double layer? How is it formed at electrode - electrolyte interface? Describe Helmholtz model for it.

14. (a) Determine the possible number and dimensions of the irreducible representation of the C_{3v} point group.

Or

(b) Explain the concept of direct product representations.

15. (a) Construct the character table for the C_{2v} point group.

Or

(b) Explain the symmetry selection rule for vibrational Raman spectroscopy.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Describe the flash photolysis method for studying kinetics of fast reactions.

17. (a) Discuss the postulates of Debye-Huckel theory. Write the expression for activity coefficient. (6)

(b) Discuss the limitations of Debye-Huckel law. (4)

18. Describe thermodynamic treatment of electrified interfaces leading to the derivation of Lippmann equation.